

## Refine Search

### Search Results -

Term	Documents
ALLOCAT\$	0
ALLOCAT	120
ALLOCATABILITY	10
ALLOCATABLE	1454
ALLOCATABLEBYTES	1
ALLOCATABLEEE	1
ALLOCATABLEPERSISTENTBYTES	1
ALLOCATABLE-ADDRESSABLE	1
ALLOCATABLE-AREA	1
ALLOCATABLE-OPT	1
ALLOCATABLE/UNALLOCATABLE	1
(L5 AND ALLOCAT\$ ).PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD.	16

There are more results than shown above. Click here to view the entire set.

**Database:**

US Pre-Grant Publication Full-Text Database  
 US Patents Full-Text Database  
 US OCR Full-Text Database  
 EPO Abstracts Database  
 JPO Abstracts Database  
 Derwent World Patents Index  
 IBM Technical Disclosure Bulletins

**Search:**

L6

**Refine Search**

**Recall Text**

**Clear**

**Interrupt**

### Search History

**DATE:** Saturday, December 10, 2005   [Printable Copy](#)   [Create Case](#)

**Set Name**  
side by side

**Query**

**Hit Count**

**Set Name**  
result set

*DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=OR*

<u>L6</u>	L5 and allocat\$	16	<u>L6</u>
<u>L5</u>	L4 and (volume near block)	21	<u>L5</u>
<u>L4</u>	L3 and (file near system)	114	<u>L4</u>
<u>L3</u>	L2 and "read-only"	158	<u>L3</u>
<u>L2</u>	snapshot near copy	478	<u>L2</u>
<u>L1</u>	snashop near copy	0	<u>L1</u>

END OF SEARCH HISTORY

## Hit List

[First Hit](#)[Clear](#)[Generate Collection](#)[Print](#)[Fwd Refs](#)[Bkwd Refs](#)[Generate OACS](#)

**Search Results - Record(s) 1 through 16 of 16 returned.**

☐ 1. Document ID: US 20050273570 A1

Using default format because multiple data bases are involved.

L6: Entry 1 of 16

File: PGPB

Dec 8, 2005

PGPUB-DOCUMENT-NUMBER: 20050273570

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20050273570 A1

TITLE: Virtual space manager for computer having a physical address extension feature

PUBLICATION-DATE: December 8, 2005

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
DeSouter, Marc A.	Wayne	NJ	US
Armangau, Philippe	Acton	MA	US
Ahmed, Ishraq Mohammed	Cary	NC	US
Glidewell, Keith	Chapel Hill	NC	US

US-CL-CURRENT: 711/203; 711/170, 711/207

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	WMO	Draw D
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☐ 2. Document ID: US 20050216788 A1

L6: Entry 2 of 16

File: PGPB

Sep 29, 2005

PGPUB-DOCUMENT-NUMBER: 20050216788

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20050216788 A1

TITLE: Fast backup storage and fast recovery of data (FBSRD)

PUBLICATION-DATE: September 29, 2005

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Mani-Meitav, Irit	Atlit		IL
Sarfati, Assaf	Tiv'on		IL

US-CL-CURRENT: 714/6

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KWIC	Draw Da
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☐ 3. Document ID: US 20050216695 A1

L6: Entry 3 of 16

File: PGPB

Sep 29, 2005

PGPUB-DOCUMENT-NUMBER: 20050216695

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20050216695 A1

TITLE: Memory extension for a data processor to provide both common and separate physical memory areas for virtual memory spaces

PUBLICATION-DATE: September 29, 2005

## INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Bono, Jean-Pierre	Westboro	MA	US

US-CL-CURRENT: 711/203; 711/207, 711/209

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KWIC	Draw Da
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☐ 4. Document ID: US 20050193245 A1

L6: Entry 4 of 16

File: PGPB

Sep 1, 2005

PGPUB-DOCUMENT-NUMBER: 20050193245

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20050193245 A1

TITLE: Internet protocol based disaster recovery of a server

PUBLICATION-DATE: September 1, 2005

## INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Hayden, John M.	Holliston	MA	US
Wang, Hongmei	Shrewsbury	MA	US
Corniquet, Frederic	Le Pecq	MA	FR
Armangau, Philippe	Acton	MA	US
Donette, Pascal	Magny les Hameaux		FR
John, Aju	Northborough		US

US-CL-CURRENT: 714/13

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KWIC	Draw Da
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☐ 5. Document ID: US 20050065985 A1

L6: Entry 5 of 16

File: PGPB

Mar 24, 2005

PGPUB-DOCUMENT-NUMBER: 20050065985  
PGPUB-FILING-TYPE: new  
DOCUMENT-IDENTIFIER: US 20050065985 A1

TITLE: Organization of read-write snapshot copies in a data storage system

PUBLICATION-DATE: March 24, 2005

## INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Tummala, Himabindu	South Grafton	MA	US
Armangau, Philippe	Acton	MA	US

US-CL-CURRENT: 707/201

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KWAC	Draw. De
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☐ 6. Document ID: US 20050015663 A1

L6: Entry 6 of 16

File: PGPB

Jan 20, 2005

PGPUB-DOCUMENT-NUMBER: 20050015663  
PGPUB-FILING-TYPE: new  
DOCUMENT-IDENTIFIER: US 20050015663 A1

TITLE: Data recovery with internet protocol replication with or without full resync

PUBLICATION-DATE: January 20, 2005

## INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Armangau, Philippe	Acton	MA	US
Bergant, Milena	North Grafton	MA	US
Srinivasan, Karthikeyan	Framingham	MA	US

US-CL-CURRENT: 714/15

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KWAC	Draw. De
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☐ 7. Document ID: US 20040267836 A1

L6: Entry 7 of 16

File: PGPB

Dec 30, 2004

PGPUB-DOCUMENT-NUMBER: 20040267836  
PGPUB-FILING-TYPE: new  
DOCUMENT-IDENTIFIER: US 20040267836 A1

TITLE: Replication of snapshot using a file system copy differential

PUBLICATION-DATE: December 30, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Armangau, Philippe	Acton	MA	US
Bergant, Milena	North Grafton	MA	US

US-CL-CURRENT: 707/203

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KWAC	Draw D
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☐ 8. Document ID: US 20040107222 A1

L6: Entry 8 of 16

File: PGPB

Jun 3, 2004

PGPUB-DOCUMENT-NUMBER: 20040107222

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20040107222 A1

TITLE: Client-server protocol for directory access of snapshot file systems in a storage system

PUBLICATION-DATE: June 3, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Venkatesh, Dinesh	Westford	MA	US
Jiang, Xiaoye	Shrewsbury	MA	US
Zheng, Jiannan	Ashland	MA	US
Vahalia, Uresh	Newton	MA	US

US-CL-CURRENT: 707/200

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KWAC	Draw D
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☐ 9. Document ID: US 20040030951 A1

L6: Entry 9 of 16

File: PGPB

Feb 12, 2004

PGPUB-DOCUMENT-NUMBER: 20040030951

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20040030951 A1

TITLE: Instantaneous restoration of a production copy from a snapshot copy in a data storage system

PUBLICATION-DATE: February 12, 2004

## INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Armangau, Philippe	Acton	MA	US

US-CL-CURRENT: 714/6

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KMC	Draw D
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☐ 10. Document ID: US 20040030846 A1

L6: Entry 10 of 16

File: PGPB

Feb 12, 2004

PGPUB-DOCUMENT-NUMBER: 20040030846

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20040030846 A1

TITLE: Data storage system having meta bit maps for indicating whether data blocks are invalid in snapshot copies

PUBLICATION-DATE: February 12, 2004

## INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Armangau, Philippe	Acton	MA	US
Tummala, Himabindu	South Grafton	MA	US

US-CL-CURRENT: 711/154; 711/159

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KMC	Draw D
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☐ 11. Document ID: US 20040030727 A1

L6: Entry 11 of 16

File: PGPB

Feb 12, 2004

PGPUB-DOCUMENT-NUMBER: 20040030727

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20040030727 A1

TITLE: Organization of multiple snapshot copies in a data storage system

PUBLICATION-DATE: February 12, 2004

## INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Armangau, Philippe	Acton	MA	US
Bergant, Milena	North Grafton	MA	US
Wang, Hongmei	Shrewsbury	MA	US
Potnis, Ajay	Sauth Grafton	MA	US
Angelone, Raymond A.	Norfolk	MA	US

US-CL-CURRENT: 707/200

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KIMC	Draw Dg
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☐ 12. Document ID: US 20030182253 A1

L6: Entry 12 of 16

File: PGPB

Sep 25, 2003

PGPUB-DOCUMENT-NUMBER: 20030182253

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20030182253 A1

TITLE: System and method for restoring a single file from a snapshot

PUBLICATION-DATE: September 25, 2003

## INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Chen, Raymond C.	Campbell	CA	US
Patel, Kayuri	Cupertino	CA	US
Kahn, Andy C.	San Francisco	CA	US
Edwards, John K.	Sunnyvale	CA	US

US-CL-CURRENT: 707/1

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KIMC	Draw Dg
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☐ 13. Document ID: US 6957362 B2

L6: Entry 13 of 16

File: USPT

Oct 18, 2005

US-PAT-NO: 6957362

DOCUMENT-IDENTIFIER: US 6957362 B2

TITLE: Instantaneous restoration of a production copy from a snapshot copy in a data storage system

DATE-ISSUED: October 18, 2005

## INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Armangau; Philippe	Acton	MA		

## ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
EMC Corporation	Hopkinton	MA			02

APPL-NO: 10/213335 [PALM]

DATE FILED: August 6, 2002



INT-CL: [07] G06 F 11/00

US-CL-ISSUED: 714/20; 714/15

US-CL-CURRENT: 714/20; 714/15

FIELD-OF-SEARCH: 714/15, 714/16, 714/19, 714/20

PRIOR-ART-DISCLOSED:

## U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
<u>4608688</u>	August 1986	Hansen et al.	371/11
<u>4686620</u>	August 1987	Ng	364/200
<u>4755928</u>	July 1988	Johnson et al.	364/200
<u>4815028</u>	March 1989	Saitoh	714/20
<u>5060185</u>	October 1991	Naito et al.	364/900
<u>5089958</u>	February 1992	Horton et al.	714/5
<u>5206939</u>	April 1993	Yanai et al.	395/400
<u>5357509</u>	October 1994	Ohizumi	714/7
<u>5381539</u>	January 1995	Yanai et al.	395/425
<u>5535381</u>	July 1996	Kopper	395/600
<u>5596706</u>	January 1997	Shimazaki et al.	395/182.04
<u>5673382</u>	September 1997	Cannon et al.	395/182.04
<u>5737747</u>	April 1998	Vishlitzky et al.	711/118
<u>5742792</u>	April 1998	Yanai et al.	395/489
<u>5819292</u>	October 1998	Hitz et al.	707/203
<u>5829046</u>	October 1998	Tzelnic et al.	711/162
<u>5829047</u>	October 1998	Jacks et al.	711/162
<u>5835953</u>	November 1998	Ohran	711/162
<u>5835954</u>	November 1998	Duyanovich et al.	711/162
<u>5915264</u>	June 1999	White et al.	711/168
<u>5923878</u>	July 1999	Marsland	395/704
<u>5974563</u>	October 1999	Beeler, Jr.	714/5
<u>6016553</u>	January 2000	Schneider et al.	714/21
<u>6061770</u>	May 2000	Franklin	711/162
<u>6076148</u>	June 2000	Kedem	711/162
<u>6078929</u>	June 2000	Rao	707/200
<u>6269431</u>	July 2001	Dunham	711/162
<u>6279011</u>	August 2001	Muhlestein	707/204
<u>6434681</u>	August 2002	Armangau	711/162
<u>6549992</u>	April 2003	Armangau et al.	711/162
<u>6594781</u>	July 2003	Komasaka et al.	714/19
<u>6618794</u>	September 2003	Sicola et al.	711/154
<u>2003/0079102</u>	April 2003	Lubbers et al.	711/202
<u>2003/0158873</u>	August 2003	Sawdon et al.	707/204
<u>2003/0188101</u>	October 2003	Fore et al.	711/114
<u>2004/0030727</u>	February 2004	Armangau et al.	714/6

2004/0030846

February 2004

Armangau et al.

711/154

## OTHER PUBLICATIONS

Mendel Rosenblum and John K. Ousterhout, "The Design and Implementation of a Log-Structured File System," ACM Transactions on Computer Systems, vol. 10, No. 1, Feb. 1992, pp. 26-52.

Fred Douglass and John Ousterhout, "Log-Structured File Systems," in Spring COMPCON89, Feb. 27-Mar. 31, 1989, Thirty-Fourth IEEE Computer Society International Conference, San Francisco, CA, pp. 124-129.

David A. Patterson, Peter Chen, Garth Gibson, and Randy H. Katz, "Introduction to Redundant Arrays of Inexpensive Disks (RAID)," in Spring COMPCON89, Feb. 27-Mar. 31, 1989, Thirty-Fourth IEEE Computer Society International Conference, San Francisco, CA, pp. 112-117.

D.L. Burkes and R.K. Treiber, "Design Approaches for Real-Time Transaction Processing Remote Site Recovery," in Spring COMPCON90, Feb. 26-Mar. 2, 1990, Thirty-Fifth IEEE Computer Society International Conference, San Francisco, CA, pp. 568-572.

"VERITAS NetBackup and Storage Migrator"  
<http://www.sun.com/stora.../netbackup.html>; \$sessionid\$QEOQTDQAAC2QHAMTA1FU5Y, published at least as early as Oct. 28, 2000, 5 pages.

R. Stager and D. Hitz, Internet Draft, filename "draft-stager-iquard-netapp-backup-0.5.txt" Network Data Management Protocol (NDMP), last update Oct. 12, 1999, pp. 1-73.

"Network Data Management Protocol (NDMP)," <http://www.ndmp.org/info/>; NDMP White Paper, <http://www.ndmp.org/info/technology/wp.html>; "Protocol Specification Summary, Document Version: 1.7.2S," [http://www.ndmp.org/info/spec\\_summary.html](http://www.ndmp.org/info/spec_summary.html);

"Legato Systems Embraces the NDMP Compliant in Q3," <http://www-ftp.legata.com/News/Press/PR209.html>; published at least as early as Oct. 11, 1999, 17 pages.

"RFC 1094--NFS: Network File System Protocol Specification," Network Working Group, Request for Comments: 1094, Sun Microsystems, Inc., Mar. 1989, pp. 1-27, <http://rfc.sunsite.dk/rfc/rfc1094.html>.

Uresh Vahalia, Unix Internals--The New Frontiers, Prentice-Hall Inc., New Jersey, 1996, Chapter 9, File System Implementations, pp. 261-289.

Brian W. Kernighan and Rob Pike, The UNIX Programming Environment, Prentice-Hall Inc., New Jersey, 1984, Chapter 2, The File System, pp. 41-70.

Koop, P., "Replication at Work. (four companies use Oracle and Sybase replication servers to solve business problems)," DBMS, vol. 8, No. 3, p. 54(4), Mar. 1995.

Remote Mirroring Technical White Paper, Copyright 1994-2002 Sun Microsystems, published at least as early as May 17, 2002 at [sun.com](http://sun.com), 25 pages.

EMC TimeFinder Product Description Guide, EMC Corporation, Hopkinton, MA, 1998, pp. 1-31.

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VERITAS Volume Replication and Oracle Databases, A Solutions White Paper, Veritas Software Corporation, Mountain View, CA, May 29, 2000, pp. 1-31.

Nabil Osorio and Bill Lee, Guidelines for Using Snapshot Storage Systems for Oracle

Databases, Oracle Corporation, Oct. 2001, pp. 12.

ART-UNIT: 2114

PRIMARY-EXAMINER: Beausoliel; Robert

ASSISTANT-EXAMINER: Chu; Gabriel L.

ATTY-AGENT-FIRM: Auchterlonie; Richard C. Novak Druce & Quigg, LLP

#### ABSTRACT:

A data storage system maintains a production dataset supported by a clone volume, and multiple snapshot datasets supported by respective save volumes in a snapshot queue. In order to instantaneously restore the production dataset with the state of any specified snapshot, the data storage system responds to requests for read/write access to the production dataset by reading from the specified snapshot dataset and writing to the production dataset. The data storage system keeps a record of data blocks that have been modified by writing to the production dataset. The data storage system initiates a process of copying data blocks from the specified snapshot dataset to the production dataset if the record of the data blocks indicates that the data blocks have not yet been modified by writing to the production dataset.

31 Claims, 40 Drawing figures

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KWMC	Draw Ds
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#### 14. Document ID: US 6934822 B2

L6: Entry 14 of 16

File: USPT

Aug 23, 2005

US-PAT-NO: 6934822

DOCUMENT-IDENTIFIER: US 6934822 B2

TITLE: Organization of multiple snapshot copies in a data storage system

DATE-ISSUED: August 23, 2005

#### INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Armangau; Philippe	Acton	MA		
Bergant; Milena	North Grafton	MA		
Wang; Hongmei	Shrewsbury	MA		
Potnis; Ajay S.	South Grafton	MA		
Angelone; Raymond A.	Norfolk	MA		

#### ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
EMC Corporation					02

APPL-NO: 10/213242 [PALM]  
 DATE FILED: August 6, 2002

INT-CL: [07] G08 F 12/00

US-CL-ISSUED: 711/162; 707/10, 707/201, 714/6, 714/15, 714/20  
 US-CL-CURRENT: 711/162; 707/10, 707/201, 714/15, 714/20, 714/6

FIELD-OF-SEARCH: 707/10, 707/201-205, 709/104, 711/161, 711/162, 711/156, 711/165,  
 714/6, 714/15, 714/20

PRIOR-ART-DISCLOSED:

# U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
<u>4608688</u>	August 1986	Hansen et al.	371/11
<u>4686620</u>	August 1987	Ng	364/200
<u>4755928</u>	July 1988	Johnson et al.	364/200
<u>5060185</u>	October 1991	Naito et al.	364/900
<u>5206939</u>	April 1993	Yanai et al.	
<u>5381539</u>	January 1995	Yanai et al.	
<u>5535381</u>	July 1996	Kopper	
<u>5596706</u>	January 1997	Shimazaki et al.	395/182.04
<u>5673382</u>	September 1997	Cannon et al.	
<u>5737747</u>	April 1998	Vishlitzky et al.	711/118
<u>5742792</u>	April 1998	Yanai et al.	
<u>5819292</u>	October 1998	Hitz et al.	707/203
<u>5829046</u>	October 1998	Tzelnic et al.	711/162
<u>5829047</u>	October 1998	Jacks et al.	711/162
<u>5835954</u>	November 1998	Duyanovich et al.	711/162
<u>5915264</u>	June 1999	White et al.	711/168
<u>5923878</u>	July 1999	Marsland	395/704
<u>5974563</u>	October 1999	Beeler, Jr.	714/5
<u>6061770</u>	May 2000	Franklin	711/162
<u>6076148</u>	June 2000	Kedem	711/162
<u>6078929</u>	June 2000	Rao	707/200
<u>6269431</u>	July 2001	Dunham	711/162
<u>6279011</u>	August 2001	Muhlestein	707/204
<u>6434681</u>	August 2002	Armangau	711/162
<u>6549992</u>	April 2003	Armangau et al.	711/162
<u>6618794</u>	September 2003	Sicola et al.	711/154
<u>6732124</u>	May 2004	Koseki et al.	707/202
<u>2001/0044910</u>	November 2001	Ricart et al.	714/6
<u>2003/0079102</u>	April 2003	Lubbers et al.	711/202
<u>2003/0158873</u>	August 2003	Sawdon et al.	707/204
<u>2004/0030846</u>	February 2004	Armangau et al.	711/154
<u>2004/0030951</u>	February 2004	Armangau	714/6

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"Extracting Data fro Incremental Data Warefouse Maintenance," Ram et al, Data Engineering 2000. Proceedings. 16th International Conference on, Mar. 2000. pp. 220-229.

Koop, P., "Replication at Work. (four companies use Oracle and Sybase replication servers to solve business problems)," DBMS, vol. 8, No. 3, p. 54(4), Mar. 1995.

Remote Mirroring Technical White Paper, Copyright 1994-2002 Sun Microsystems, published at least as early as May 17, 2002 at sun.com, 25 pages.

EMC TimeFinder Product Description Guide, EMC Corporation, Hopkinton, MA, 1998, pp. 1-31.

Leveraging SnapView/IP in Oracle8i Environments with the CLARiiON IP4700 File Server, Engineering White Paper, EMC Corporation, Hopkinton, MA, Feb. 13, 2002, pp. 1-16.

Using EMC CLARiiON FC4700 and SnapView with Oracle 8i, Engineering White Paper, EMC Corporation, Hopkinton, MA, Mar. 4, 2002, pp. 1-22.

Disaster Recovery Guidelines for using HP SureStore E XP256, Continuous Access XP with Oracle Databases Rev 1.03, Hewlett-Packard Company, Palo Alto, CA, May 2000, pp. 1-28.

Enterprise Volume Manager and Oracle8 Best Practices, Compaq White Paper, Compaq Computer Corporation, Dec. 1999, pp. 1-11.

VERITAS Database Edition for Oracle, Guidelines for Using Storage Checkpoint and Storage Rollback with Oracle Databases, Veritas Software Corporation, Mountain View, CA, Aug. 2001, pp. 1-16.

VERITAS Volume Replication and Oracle Databases, A Solutions White Paper, Veritas Software Corporation, Mountain View, CA, May 29, 2000, pp. 1-31.

Nabil Osorio and Bill Lee, Guidelines for Using Snapshot Storage Systems for Oracle Databases, Oracle Corporation, Oct. 2001, pp. 12.

"RFC 1094--NFS: Network File System Protocol Specification," Network Working Group, Request for Comments: 1094, Sun Microsystems, Inc., Mar. 1989, pp. 1-27, <http://rfc.sunsite.dk/rfc/rfc1094.html>.

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least as early as Oct. 11, 1999, 17 pages.

ART-UNIT: 2187

PRIMARY-EXAMINER: Chace; Christian P.

ATTY-AGENT-FIRM: Auchterlonie; Richard C. Novak Druce & Quigg, LLP.

ABSTRACT:

A file server maintains a production file system supported by a clone volume, and multiple snapshot file systems supported by respective save volumes in a snapshot queue. Before a data block is modified for the first time after creation of the youngest snapshot, the data block is copied from the clone volume to the save volume of the youngest snapshot. A bit map indicates the blocks that have already been copied, and a block map shows the save block address for each corresponding clone block address. When a new snapshot is created, the bit and block maps are converted to a hash index that is kept linked to the save volume of what had been the youngest snapshot. When other than the oldest snapshot file system is deleted, the respective save volume is retained as a hidden object until it becomes the oldest save volume.

54 Claims, 40 Drawing figures

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KMIC	Draw D
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☐ 15. Document ID: US 6792518 B2

L6: Entry 15 of 16

File: USPT

Sep 14, 2004

US-PAT-NO: 6792518

DOCUMENT-IDENTIFIER: US 6792518 B2

TITLE: Data storage system having mata bit maps for indicating whether data blocks are invalid in snapshot copies

DATE-ISSUED: September 14, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Armangau; Philippe	Acton	MA		
Tummala; Himabindu	South Grafton	MA		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
EMC Corporation	Hopkinton	MA			02

APPL-NO: 10/213241 [PALM]

DATE FILED: August 6, 2002

INT-CL: [07] G06 F 12/00

US-CL-ISSUED: 711/162; 711/112, 711/156, 707/203, 707/204, 714/5  
 US-CL-CURRENT: 711/162; 707/203, 707/204, 711/112, 711/156, 714/5

FIELD-OF-SEARCH: 707/203, 707/204, 711/112, 711/156, 711/161, 711/162, 714/5

PRIOR-ART-DISCLOSED:

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R. Stager and D. Hitz, Internet Draft, filename "draft-stager-iquard-netapp-backup-0.5.txt" Network Data Management Protocol (NDMP), last update Oct. 12, 1999, pp. 1-73.

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ART-UNIT: 2187

PRIMARY-EXAMINER: Moazzami; Nasser

ASSISTANT-EXAMINER: Chace; Christian P.

ATTY-AGENT-FIRM: Novak Druce LLP Auchterlonie; Richard C.

#### ABSTRACT:

In a data storage system providing access to a production dataset and snapshot



copies of the production dataset, a production meta bit map identifies blocks of storage that are invalid in the production dataset. If a block in the production dataset is invalid when a snapshot copy is being made, then there is no need to copy the block to storage for the snapshot before writing to the block. Moreover, if a block in the production dataset supporting a snapshot copy is dynamically invalidated, it may be kept in the production dataset until it is written to. For this purpose, a respective snapshot copy of the meta bit map is made and kept with each of the snapshot datasets, and the snapshot copies of the meta bit map are merged in order to indicate the blocks that are invalid for all of the snapshots.

46 Claims, 40 Drawing figures

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	RMK	Draw D
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☐ 16. Document ID: US 20050065985 A1

L6: Entry 16 of 16

File: DWPI

Mar 24, 2005

DERWENT-ACC-NO: 2005-252887

DERWENT-WEEK: 200526

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TITLE: File server operation method in data network, involves checking whether save volume block is allocated to specified block of read-write snapshot copy of production file system, and reading data from allocated save block

INVENTOR: ARMANGAU, P; TUMMALA, H

PRIORITY-DATA: 2003US-0668783 (September 23, 2003)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
<u>US 20050065985 A1</u>	March 24, 2005		024	G06F012/00

INT-CL (IPC): G06 F 12/00

ABSTRACTED-PUB-NO: US20050065985A

BASIC-ABSTRACT:

NOVELTY - The save volume blocks are allocated to a specified block of a read-write snapshot copy of a production file system, while writing new data to read-write snapshot copy. The allocation of save volume block to specified block of read-write snapshot copy, is checked while reading read-write snapshot copy. When save block is allocated, data from allocated block is read, else related read-only snapshot copy of file system is read.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for file server.

USE - For operating file server (claimed) used for creating and maintaining rear-write snapshot copy of production file system in data network.

ADVANTAGE - The series of read-only snapshots of the production file system are maintained in the file server efficiently. The backup processing time and the backup storage capacity of the file server are reduced reliably. The production

file can be restored with specified read-write snapshot copy easily.

DESCRIPTION OF DRAWING(S) - The figure shows a block diagram of the data network.

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KWIC	Draw Dc
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Clear	Generate Collection	Print	Fwd Refs	Bkwd Refs	Generate OACS
-------	---------------------	-------	----------	-----------	---------------

Term	Documents
ALLOCAT\$	0
ALLOCAT	120
ALLOCATABILITY	10
ALLOCATABLE	1454
ALLOCATABLEBYTES	1
ALLOCATABLEEE	1
ALLOCATABLEPERSISTENTBYTES	1
ALLOCATABLE-ADDRESSABLE	1
ALLOCATABLE-AREA	1
ALLOCATABLE-OPT	1
(L5 AND ALLOCAT\$ ).PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD.	16

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